

A

75

RELATION

Of an Extraordinary

170. b-21.
2

Sleepy Person

A T

TINSBURY, near BATH.

R

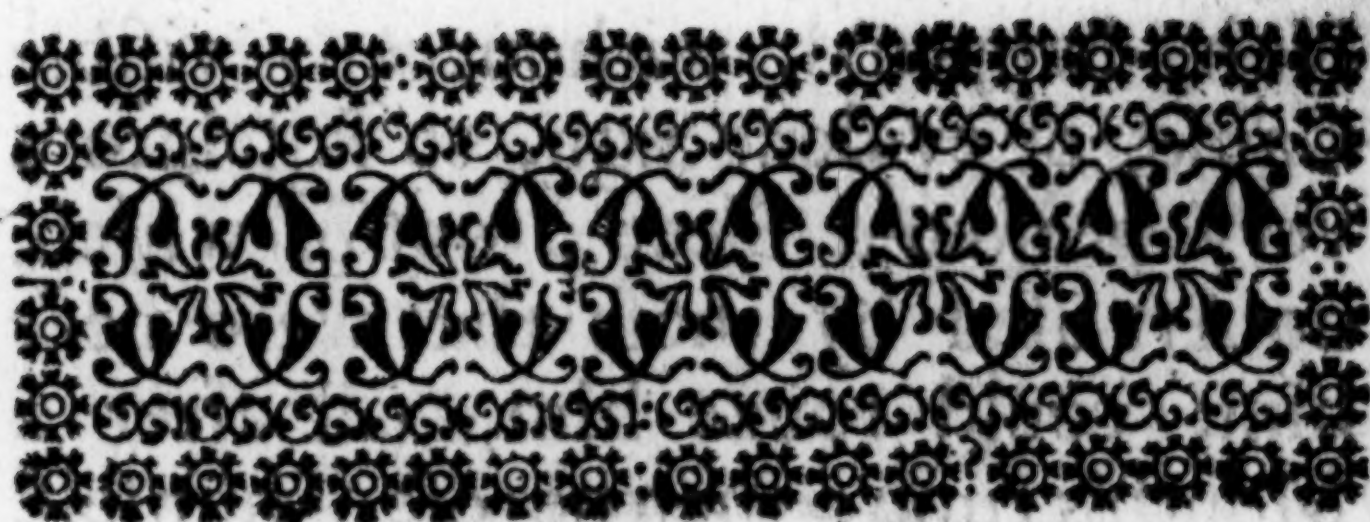
By WILLIAM OLIVER, M.D. and F.RS.



LONDON,

Printed by J. DARBY in *Bartholomew-Close*,
for HENRY HAMMOND Bookseller in
Bath. M. DCC, XIX.





A
RELATION

Of an Extraordinary
SLEEPY PERSON

A T
Tinsbury, near Bath.



AT the 13th, Anno 1694.
one Samuel Chilton, of Tinsbury near Bath, a Labourer,
about twenty five years of
Age, of a robust Habit of Body, not
fat,

fat, but fleshy, and a dark brown Hair, happen'd, without any visible Cause, or evident Sign, to fall into a very profound Sleep; out of which, no Art used by those that were near him, could rouse him, till after a Month's time: then he rose of himself, put on his Clothes, and went about his Business of Husbandry as usual; slept, could eat and drink as before, but spake not one word till about a Month after. All the time he slept, Victuals stood by him: his Mother, fearing he would be starv'd in that sullen Humour, as she thought it, put Bread, and Cheese, and Small-Beer before him, which was spent every day, and suppos'd by him, tho no one ever saw him eat or drink all that time.

From this time he remain'd free of any Drowsiness or Sleepiness till about the 9th of *April*, 1696. and then he fell into his sleeping Fit again just as he did before. After some days they were prevail'd with to try what effect Medicines might have on him; and accordingly

a Sleepy Person.

5

accordingly one Mr. Gibbs, a very able Apothecary at Bath, went to him, bled, blister'd, cupp'd and scarify'd him, and us'd all the external irritating Medicines he could think on; but all to no purpose, nothing of all these making any manner of Impression on him: and after the first Fortnight he was never observ'd to open his Eyes. Victuals stood by him as before, which he eat of now and then, but no body ever saw him eat or evacuate, tho he did both very regularly, as he had Occasion; and sometimes they have found him fast asleep, with the Pot in his Hand in Bed, and sometimes with his Mouth full of Meat. In this manner he lay for about ten Weeks, and then could eat nothing at all; for his Jaws seem'd to be set, and his Teeth clinch'd so close, that with all the Art they had with their Instruments they could not open his Mouth, to put any thing into it to support him. At last observing a Hole made in his Teeth, by holding his Pipe in his Mouth, as
most

most great Smoakers usually have, they, thro a Quill, pour'd some Tent into his Throat now and then : And this was all he took for six Weeks and four Days, and of that not above three Pints or two Quarts, some of which was spilt too. He had made water but once, and never had a Stool all that time.

August the 7th, which is seventeen Weeks from the 9th of *April* (when he began to sleep) he awaked, put on his Clothes, and walk'd about the Room, not knowing he had slept above a Night ; nor could he be persuaded he had lain so long, till going out into the Fields, he found every body busy in getting in their Harvest ; and he remember'd very well, when he fell asleep they were sowing of Barley and Oats, which he then saw ripe and fit to be cut down.

There was one thing observable, That tho his Flesh was somewhat wasted with so long lying in Bed, and fasting for above six Weeks ; yet a worthy Gentleman his Neighbour assur'd

assur'd me, when he saw him, which was the first Day of his coming abroad, he look'd brisker than ever he saw him in his Life before; and asking him whether the Bed had not made him sore, he assur'd him and every body, that he neither found that, nor any other Inconveniency at all; and that he had not the least remembrance of any thing that past or was done to him all that while. So he fell again to his Husbandry, as he us'd to do, and remain'd well from that time till *August* the 17th, *Anno* 1697. when in the Morning he complain'd of a Shivering and Coldness in his Back, vomited once or twice, and that same day fell into his sleeping Fit again.

Being then at the *Bath*, and hearing of it, I took Horse on the 23d, to inform my self of a Matter of Fact I thought so strange. When I came to the House, I was by the Neighbours (for there was no body at home at that time besides this Man) brought to his Bed-side, where I found him asleep,

asleep, as I had been told before, with a Cup of Beer, and a Piece of Bread and Cheese upon a Stool by his Bed, within his reach. I took him by the Hand, felt his Pulse, which was at that time very regular; I put my Hand on his Breast, and found his Heart beat very regular too, and his Breathing was easy and free; and all the Fault I found was, that I thought his Pulse beat a little too strong: he was in a breathing Sweat, and had an agreeable Warmth all over his Body. I then put my Mouth to his Ear, and as loud as I could, call'd him by his Name several times, pull'd him by the Shoulders, pinch'd his Nose, stopt his Mouth and Nose together, as long as I durst, for fear of choaking him, but all to no purpose; for in all this time he gave me not the least Signal of his being sensible. I lifted up his Eye-lids, and found his Eye-balls drawn up under his Eye-brows, and fix'd without any Motion at all. Being baffled with all these Tryals, I was resolv'd to see
what

what Effects *Spirit* of *Sal Armoniac* would have, which I had brought with me to discover the Cheat, if it had been one: so I held my Viol under one Nostril a considerable time; which being drawn from Quick-lime, was a very piercing Spirit, and so strong I could not bear it under my own Nose a moment, without making my Eyes water; but he felt it not at all. Then I threw it, at several times, up that same Nostril; it made his Nose run and gleet, and his Eye-lids shiver and tremble a very little; and this was all the Effect I found, tho I pour'd up into one Nostril about a half-ounce Bottle of this fiery Spirit, which was as strong almost as Fire it self. Finding no Success with this neither, I cramm'd that Nostril with Powder of *White Hellebore*, which I had by me, in order to make my farther Tryals; and I can hardly think any Impostor could ever be insensible of what I did. I tarry'd some time afterwards in the Room, to see what Effects all together might have upon him; but he

never gave any Token that he felt what I had done, nor discover'd any manner of Uneasiness, by moving or stirring any one part of his Body, that I could observe. Having made these my Experiments, I left him, being pretty well satisfied he was really asleep, and no fullen Counterfeit, as some People thought him.

Upon my return to *Bath*, and relating what I had observed, and what Proofs this Fellow had given me of his Sleeping, a great many Gentlemen went out to see him, as I had done, to satisfy their Curiosity in a Rarity of that Nature, who found him in the same Condition I had left him in the day before; only his Nose was inflamed and swelled very much, and his Lips and the inside of his right Nostril blistered and scabby, with my *Spirit* and *Hellebore*, which I had plentifully dosed him with the Day before: His Mother upon this, for some time after, would suffer no body to come near him, for fear of more Experiments upon her Son. About ten Days after I had been with him,
Mr.

Mr *Woolmer*, an experienced Apothecary at *Bath*, called at the House, being near *Tinsbury*, went up into the Room, finding his Pulse pretty high, as I had done, takes out his Launcet, lets him Blood about fourteen Ounces in the Arm, ties his Arm up again, no body being in the House, and leaves him as he found him; and he assured me he never made the least Motion in the World when he prickt him, nor all the while his Arm was bleeding.

Several other Experiments were made by those that went to see him every day from the *Bath*; but all to no purpose, as they told me on their Return. I saw him my self again the latter end of *September*, and found him just in the same Posture, lying in his Bed, but removed from the House where he was before about a Furlong or more; and they told me, when they removed him by Accident, carrying him down Stairs, which were somewhat narrow, they struck his Head against a Stone, and gave him a severe Knock, which broke his

Head, but he never moved any more at it than a dead Man would. I found now his Pulse was not quite so strong, nor had he any Sweats, as when I saw him before. I tried him again the second time, by stopping his Nose and Mouth, but to no purpose; and a Gentleman, then with me, ran a large Pin into his Arm to the very Bone unknown to me; but he gave us no manner of Tokens of his being sensible of any thing we did to him. In all this time they assured me no body had seen him either eat or drink, tho they endeavoured it all they could, but it always stood by him, and they observed sometimes once a day, sometimes once in two days, all was gone. 'Tis farther observable, he never fouled his Bed, but did his necessary Occasions always in the Pot.

In this manner he lay till Nov. 19. when his Mother hearing him make a Noise, ran immediately up to him, and found him eating. She asked him how he did? He said, Very well, thank God: She asked him again, which he liked best, Bread and Butter, or Bread
and

and Cheefe? He answer'd, Bread and Cheefe. Upon this, the poor Woman overjoyed, left him, to acquaint his Brother with it; and they came strait up into the Chamber to discourse him, but found him as fast asleep again as ever, and all the Art they had could not wake him. From this time, to the end of *January*, or the beginning of *February* (for I could not learn from any body the very day) he slept not so profoundly as before; for when they called him by his Name, he seemed to hear them, and be somewhat sensible, tho he could not make them any Answer. His Eyes were not now shut so close, and he had frequently great Tremblings of his Eye-lids, upon which they expected every day when he would wake, which happened not till about the time just now mentioned, and then he waked perfectly well, not remembering any thing that happened all this while. 'Twas observed he was very little altered in his Flesh, only complained the Cold pinched him more than usually, and so presently
fell

fell to Husbandry as at other times.

I have no reason to suspect this to be a Cheat, because I never heard of any Gain to the Family by it, tho so near the *Bath*, and so many People went thither out of Curiosity to see the Sleeper, who when awake was a Support to his old Mother by his Labour, but now a certain Charge to her. Besides, there was seldom any body in the House to attend any Profit might be made by it, he being left alone in the House, and every body at liberty to go up to his Bed-side.

I am very apprehensive I have laid my self too open to the Censures of the World in this Relation I have here given of this uncommon *Sleeper*, because many will be apt to conclude at first sight, that 'tis impossible it should be true; as if they were acquainted with all the *Mysteries of Nature*. *Inest & in incredibili verum*, says *Minutius Felix*, there may be Truth in what seems to us incredible. Whoever will give himself the Trouble to inquire into the Matter of Fact at *Bath*, may be satisfied that it's really so.
Now,

Now, if it be no forg'd thing, but an undoubted Truth, there needs no Philosophy to prove it possible, *Ab esse ad posse valet consequentia*. From this so odd a Story two Questions naturally arise, which the World may expect I should say something to. And the first is, How any Man can sleep so long, eat and drink between whiles, and not be sensible, nor remember any thing that past all that time? *2dly*, How it can be possible that any Person could subsist so long as 6 Weeks and odd Days, without Food and Evacuation?

To the first I answer: The Doctrine of *Sensation* depending on the *Soul* as its proper original Cause, till we are agreed what the *Soul* is, or wherein its *Essence* does consist, that must be obscure and dark, being one of the Operations by which the *Soul* is known to exist. I shall not trouble my *Reader* with all the *Notions* the *Antients* have had about the *Soul*, some thinking it a *Fire*, a *Wind*, a *Spirit*, or a thin *Body*; contented with what is generally allow'd by the greatest part of
of

of Mankind, *viz.* That 'tis a *Being* distinct from the *Body*, separable from it, and capable of existing out of it. This is that *Principle* in us by which we live, move, feel and understand, which we call *Mind*. This is what I think the *Antients* call'd *Particula Auræ Divinæ*, and what the *Moderns* call the *Rational Soul*. Of which we can have no Knowledge *à Priori*, but by its Operations *à Posteriori* we may, when we *Think, Reason, Desire, Believe, Remember* any thing, or our Senses dictate to us *Pain* or *Pleasure*. Then have we a *Certainty* of our *Existence*, and that these *Attributes* are altogether incompatible with mere *Matter*, which is wholly *passive*. For this reason it more properly belongs to an active *Principle*, whose *Essence* consists in *Action*, which the *Cartesians* call *Cogitation*. And thus the *Soul* is describ'd by them to be the *Internal Principle* within us of our *Thoughts, Appetites, and Will*, by whose help all the *Functions, and Operations* are produc'd, which proceed from *Thought*. (a)

(a) Le Forge de Mente Humana, cap. 2.

And

And in his 6th Chapter, he affirms that the *Soul* is a *Spirit* that always thinks, and can never cease thinking, as long as it does exist, and that it ceases to be as soon as it ceases to think. *Descartes* (b) explains this Notion, that he means by *Cogitation*, sometimes the *Action*, sometimes the *Power*, and sometimes the *Thing* in which this Power is. The Learned Mr. *Locke*, in his *Essay of Human Understanding*, says, He cannot conceive it any more necessary for the *Soul* always to think, than for the *Body* always to move, the Conception of the *Ideas* being to the *Soul* what Motion is to the *Body*, not the *Essence*, but one of its Operations; and therefore, tho Thinking be ever so much the proper *Action* of the *Soul*, yet 'tis not necessary to suppose that the *Soul* should always *think*, nor is it essential to *Matter* always to be in motion, for then Rest alone would annihilate it. And yet I believe it will be a very hard Task for any body to assign Rest to any Particle of *Matter* in the *Universe*, not only because of the

(b) Meditat. p. m. 98.

Diurnal Motion of all *Orbs* within their *Vortexes*, but also upon the account of the *Intestine Motion* of the smaller Particles of Matter in the *Bowels* of the Earth, there being nothing else but a constant *Series* of *Generations* and *Corruptions* every where. Whether want of *Cogitation* or actual *Thinking* would destroy the *Soul*, is not so manifest to us, who have not so good *Ideas* of the *Soul*, as we can have of *Matter*. What the *Powers* of *Matter* are, we may have a tolerable *Notion* of; but what those of the *Soul* are, we are at a loss when we begin to think of them. *Hippocrates* (a) thinks *Heat* the Cause of *Thought*; and some there are suppose it the *Result* of *Particles* of *Matter* so dispos'd and rang'd together, as to be able to produce *Thought* in us, and all the *Operations* before-mention'd. Thus a *Watch* or *Clock* shows the *Hour*, and the *Motions* of the *Heavenly Bodies*, by its *Springs* and *Wheels* so ordered and contriv'd. 'Tis the received Opinion, when we begin to live, feel, &c. we are indued

(a) Lib. de Carnibus,

with an Intellectual Soul, and that *Death* is the Recess or Departure of it from the Body. That *Life* may be without *Thought*, is plain in Vegetation; but how *Sense* can be without it, is hard to be made out. Upon the whole, if the *Soul* be a *Spirit*, congenial with *Angels*, how can it cease from *Action* or *Thought*? If only a *Power*, it may act or not act, think or not think at pleasure: If the *Result* of the Contexture of the Particles of Matter, then it acts out of mere Necessity, and Men judge and think better than others, because better put together: The *Fox* is cunninger than the *Ass*, and the whole Family of *Hares* make better shifts when hunted than a *Fox*, because their Organs are more adapted for such Evasions. Philosophers tell us there are three *Souls* in *Man*, the *Rational*, the *Sensitive*, and the *Vegetative*; and that these are distinct in their *Properties*, *Attributes* and *Offices*, one from the other. That the two last are subordinate to the first, which they tell us distinguishes a *Man* from a *Beast*, as the Sensitive

Soul does the *Beast* from the *Plant*. Now if this Philosophy be true, the Rational *Soul* being lost for a time, the Sensitive eclips'd, and nothing left but the Vegetative; this Creature, when inspired with the Divine *Ray of Reason*, was honour'd with the Dignity of a Man, but in his sleepy Fit fall'n below the Degree of the Sensitive *Plant*. And the Story of *Hermetimus* mention'd by *Plutarch* (a), *Tertullian* (b), and *Pliny* (c), may be true too, whose *Soul* frequently left his Body, went into far Countries, and gave an account of what pass'd there; which that Wag *Lucian* laughs at as a Fable, in his *Encomium Muscæ*. Not unlike this is what St. *Austin* tells us (d) of one *Restitus*, a Priest in *Phœnicia*, who would fall down at pleasure so like a dead Man, that he neither breath'd nor felt when they pinch'd or burnt him; and this he would do at any time, to gratify any

(a) Lib. de Genio Socratis.

(b) De Anima.

(c) Lib. 7. c. 52.

(d) Lib. 14. cap. 24. de Civitate Dei.

body that desired him. After all, he that can tell me what the Essence of the *Soul* is, how as a *Spirit* it operates on Matter, and what Cement 'tis that keeps them together, whoever will unriddle to me those Mysteries, shall be my *Apollo*. Till that time I shall say with *Lucretius*,

Ignoratur enim quid sit Natura Animai.

So that till we can come to a certain Knowledge what the *Soul* is, we can never come to the Knowledge of its *Powers* and *Operations*, nor ought to determine any thing positively concerning it as impossible.

Question the 2d, How it can be possible that any Person could subsist so long as six Weeks and odd Days, without Food or Evacuation?

I answer; it will be no easy Undertaking to persuade the World, that any Man can abstain from *Food* so long, because knowing how few hours they can live without Recruits themselves, they can have no Notion how any body can subsist so many

ny Weeks. But what has been, may be; and very learned Men assure us of their own Knowledge, that the Matter of Fact is true, that Persons have lived several Weeks without eating any thing considerable all the time. Certain it is, in Persons in Health, whose *Vital Heat* is brisk, the Case differs mightily; for such must have Nourishment to supply the Expence they are at by Perspiration and other Evacuations. But in this Case the *Heat* is calm and gentle, and consumes their Blood and Spirits very slowly, as a *Lamp* burns slowly, when there is much *Oil* and little *Flame*. We have frequent Examples of *Leuco-Phlegmatick Virgins*, who from a gradual Decay of *Appetite*, have fallen at length into an absolute Aversion from all Food, and endured a long Abstinency, without either *Miracle* or *Imposture*. Where the *Motion* and *Ferments* of the Blood is small, the *Expence* must be so too, in this *Morbid State*, and the less Recruits are required for the supporting and sustaining so languid and weak a Life.
And

And this I take to be the meaning of that Saying of *Hippocrates* (a); Such as are of a hot bilious Constitution, cannot bear the Inconveniency of Fasting, so well as such as are of a phlegmatick Nature. And this, I take it, is the Case of *Abstinent*s, such as live long without Food; they are of a very cold Constitution, and abound with a thick viscous Phlegm in their Stomach and Intestines, which destroys the Appetite and Sense of those Parts; so that there the Motion is slow, little or no Evacuation by Perspiration, Stool, or Sweat. Experience tells us, that those *Animals* that sleep long, such as *Dormice*, *Vipers*, *Snails*, *Bats*, and the like, are all cold Creatures, live under Ground or in Holes all Winter, and in Summer only appear, when the *Sun's* Heat is strong enough to raise their *vital Heat*, that before was checked by Cold. My Argument would be much stronger, if the Relation of Baron *Herberstein* were true (b), who tells

(a) De Victu Acutor.

(b) Comment. Rer. Muscovit.

us, there are in the *Northern* Parts of *Muscovy*, near the River *Oby*, on the Borders of *Tartary*, a People he calls *Leucomori*, who sleep from the 27th day of *November* till the 23d of *April*, like *Tortoises* under Ground, and then come to Life again, tho quite frozen all the Winter. This Gentleman was twice Ambassador in *Russia* from *Ferdinand* the Emperor, and dedicated his Commentaries to him when he returned the second time: but nevertheless, he must have a strong Faith that can believe it. I can easily foresee an Objection will arise, That the Animals, I have mentioned, when they sleep and fast thus, act according to the determined *Laws* of their own *Nature*; so that there can't be the same Parity of *Reason* for the one that there is for the other.

I answer: Animal or Sensitive *Life* is the same in *Mankind* as in these *Brutes* I have mentioned, *Nature* acting univocally in all Creatures. They eat, drink, and sleep as we do, are nourished in the same manner as we are, have their *Veins*, *Arteries*, and
Nerves,

Nerves, which serve for the same Uses ours do; only our Constitutions are warmer, and we are better able to subsist in Winter than such Animals as we have named can. But suppose by Sickness our Blood and Humours should be congealed, or in a manner frozen within us, or that our Spirits should be inviscated or fettered, that they cannot exert themselves in so glutinous a Phlegm, and the *vital Heat* is become dull and languid, which is their Case, and may be ours: I say then, when we are reduced to their *Temperament*, which is not impossible but we may be, I see no Reason, according to the *Laws of Motion*, why the *Effect* upon us should not be the same. Thus Man, when in *Health*, cures Wounds with his *Saliva*, or Spittle, which in a morbid State, *viz.* in the Disease called *Hydrophobia*, becomes as venomous and fatal as that of a *Viper* or a *Rattle-Snake*. Now 'tis more to my purpose, if it be true, as the Learned suppose it, that this *Poison* is not only occasioned by the Bite of a mad *Dog*, or

any other Creature, but 'tis possible without any manifest Cause may be bred within us, as *Celius Aurelianus* (a), *Petrus Borellus* (b), and some others I could mention, have deliver'd as their Opinion upon their own Observation.

'Tis moreover probable that the *Air* may contribute something towards the Support of the Animal Life for a considerable time. If all Bodies are as well inspirable as expirable, as was said and prov'd before, why may not the *Air*, entering into our *Pores*, convey with it such a Moisture as may nourish in proportion to the Expence? *Est in Aere occultus vita cibus*, says *Cosmopolita*. Thus *Air* consisting of various Exhalations, and Vapours from all Parts, by the purer *Æther's* Elasticity, may become congenial with our Spirits, and supply us with Nourishment for a time. That there is a *Magnetism* in Liquids as well as Solids, the ingenious *Sini-*

(a) De Morbis Acutis, cap. de *Hydrophobia*.

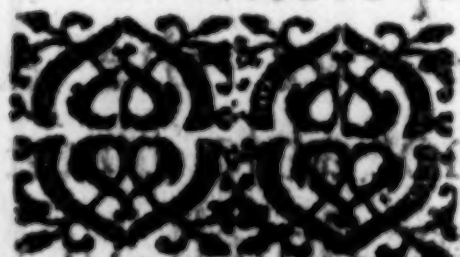
(b) Cent. 2. Obs. 52.

baldi (a) is of opinion, and that similar Bodies attract one another. That an Animal may be supported and nourish'd by *Air*, he proves by Experiment, That young *Vipers*, not above an Inch long, put into an empty Glass, cover'd with Paper, prickt with holes to let in Air, will, in less than a Year's time, grow to be a Foot long without Food. That the Process of *Nutrition* is perform'd $\alpha\tau\mu\omicron\epsilon\iota\delta\omega\varsigma$, *sub specie Vaporis*, is the Opinion of very learned Men. The ingenious Dr. *Ent* will not allow the Nutricious Juices should have any Thickness in them. That Smells are very refreshing, every body has experienc'd. Thus good old *Democritus*, at the Age of 109, and dying, not able to eat, was supported by the Smell of new Bread dipt in Honey three Days together, till the Feasts of *Ceres* were over, as *Diogenes Laertius* tells us in his Life. And I am perswaded Cooks are generally fat more from the Smell of

(a) Apollo Bifrons, p. m. 177.

Victuals than from what they eat.
 If these things are in Nature, as I
 am prone to think they are, then a
 Man or Woman may live several
 Months with very little or no Food
 all that time.

F I N I S.





*BOOKS Printed for Henry Hammond
at Bath.*

THREE Sermons preach'd on three particular Subjects, *viz.* I. King *GEORGE* the Security of the Church of *England*. On *Isa.* 63. 10. II. The Church of *England* the Standard to regulate all other Churches by, at the Fall of Popery. On *Isa.* 2. 2. III. An Exhortation to Love and Peace, as the Means to fit us for such Blessings. On *Luke* 19. part of *Ver.* 42. By *Arthur Bedford*, M. A.

The Doctrine of Obedience and Non-Resistance due to the Higher Powers, explain'd, stated, and vindicated; with proper Inferences from the same: In a Sermon preach'd at the Assizes held at *Taunton* in the Town of *Somerset*, on Tuesday *March* 19. 1715. By the same Author.

The Obligations which lie both upon Magistrates and others, to put the Laws in execution against Immorality and Profaneness: In a Sermon preached at the Assizes held at *Wells* in the County of *Somerset*, on Wednesday the 28th Day of *August*, in the Year of our Lord 1717. before Sir *Robert Eyre* and Sir *James Mountague*, being his Majesty's Judges for the said Circuit. By the same Author.

A serious Remonstrance in behalf of the Christian Religion, against the horrid Blasphemies and Impieties which are still used in the *English* Play-Houses, to the great Dishonour of Almighty God, and in contempt of the Statutes of this Realm. By the same Author.

Bath-Memoirs, written by Dr. *Pierce* of the *Bath*.

Scholæ Bathoniensis Primitiæ : seu Excerpta quædam à *Walleri* & *Milioni* Poematibus, Latino Carmine, à Scholaribus quibusdam *Scholæ Grammaticalis Bathoniensis*, donata.

Practical

BOOKS Printed for H. Hammond.

Practical Discourses on the several Parts and Offices of the Liturgy of the Church of *England*. Wherein are laid open the Harmony Excellency, and Usefulness of its Composure. In four Parts, bound in 5 Vol. Useful for all Families.

A Practical Exposition of the Church Catechism: in several Discourses on all the Parts of it. In two Volumes. Useful for all Families. The second Edition.

Six Discourses on several Occasions.

These three by the Revd *Matthew Hole*, D. D. Rector of *Exeter-College* in *Oxford*.

A Practical Dissertation on *Bath-Waters*. Treating of the Antiquity of Bathing. Of the Original of Springs. Of the Cause of the Heat of *Bath-Waters*; and of their Ingredients. Of drinking *Bath-Waters*. Of Bathing. Of the City of *Bath*, its Situation, Baths, &c. By *William Oliver*, M. D. and F. R. S.